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Mathematics in the service of man*

Svante Wold (*l*) is CIC research fellow at the Institute of Chemistry, Free University of Lapland, Umeå, Sweden. He leads the Research group of Pretentious Mathematics where **G. Enius** (*r*) is a perennial graduate student. The group's research in the quantification of trivial problems has given them strong contacts with Maynarhs da'Koven, University of Washington, Seattle

The possibility that freon driving gases in spray cans might interfere with the protecting ozone layer around the earth and thereby increase the amount of ultraviolet radiation at the surface of the earth has been pointed out. In our long-term program for applying mathematics and statistics, not to mention operations analysis, information theory and Fortran programming, to urgent problems, we have solved the problem in the following way:

1. Formulate the problem as one of mathematics.

$$H = F(A,C,U) + \epsilon \qquad (1)$$

Harm (H) is a function of amount of driving gas (A), its chemical composition (C), unforeseen factors (U) plus small random deviations (ϵ). Though the latter often are incorporated in *U*, it will be seen that it simplifies the mathematical treatment to keep the unforeseen factors and the random deviations separated.

2. Solve the mathematical problem.

Keeping *U* and ϵ constant (since these factors are beyond our control), we concentrate on the form of the function *F* and the factors *A* (amount) and *C* (chemical composition). Integrating over *A*, we get directly

$$\oint F = \langle H,C \rangle \qquad (2)$$

From eqn. (2) we see that by introducing a suitable *C*, we can even make *H* negative; i.e., for certain *C* the environmental effects will be positive. Seeking a value for *C* which maximizes *H*, we solve this variational problem by perturbation theory and obtain the following characteristic values for *C*:

$m_C = 48.02 \pm .06$ (molar weight)

$n = 3.1 \pm .17$ (number of atoms)

$j = 1.99 \pm .32$ (number of unpaired electrons)

3. Interpretation of the results.

Our results show that if some certain single compound (the treatment of mixtures is presently too complex for our methodology) is used as driving gas in spray cans, not only will the environmental harm of these cans vanish, but, more interestingly, the environment will improve, i.e., the protecting ozone layer will thicken. This result seems to have been overlooked by other workers, probably because of their lack of proper mathematical training and insight.

4. Practical points.

Though there are a number of chemical compounds satisfying the parameters listed above, only one seems to be commercially available, O_3. We have prepared some spray cans (hair spray, shaving cream, instant whipped cream and general deodorant) with it as driving gas. Some observed small side effects such as abnormal loss of hair, skin rash and blemishes, bad taste and itching, will hopefully be minimized by our continued research. Thus no main obstacles for using O_3 as driving gas have been found; we therefore predict a rapid switch from freons to O_3 in spray cans as soon as patent rights and other administrative formalisms have been cleared.[a]

Acknowledgments

One of us (G.E.) thanks one of the referees (X.X.X.) for pointing out that our discovery is a classic case of the classic research philosophy which states "If you can't beat 'em; join 'em."

We are grateful for financial support from Northern Swedish Chemical Society through grants 1A and 2B. G.E. was in addition supported by a post-doctoral fellowship from CIC through its local Umea office (contract no. 1948-14617-19-FX2, changed 1954, 1966 and 1972).

The original English version of this paper appeared in the *Journal of Irreproducible Results*, from which this translation was made with permission.

* Man includes women, from whence it came.

[a] A detailed report including many experimental figures can be obtained by submitting full credentials including possible connections to subversive and other organizations to: The Registrar, CIC, G 1:10, PI-3326 Gullsjö, S-911 00 Vännäs, Sweden.

Authors' address: Institute of Chemistry, Free University of Lapland, S-901 87, Umea, Sweden.

Author's guide

CHEMTECH's manuscript selection criteria

Most CHEMTECH manuscripts are still solicited, though this is not by design. *We welcome voluntary submissions of broad appeal to mission-oriented technologists.* The main criterion of selection is a positive answer to either of two questions (or, preferably, both):

- Will the paper help a lot of technologists do their jobs better, more creatively, more efficiently and, in short, help bring science rapidly and sensitively into the social sphere?
- Will this paper spark and help satisfy the innate curiosity of chemistry-oriented professionals and lead them readily into unanticipated areas of exploration?

It is thus apparent that full technical papers, though valued most, are not the only kinds sought. It should also be apparent that prior publication is not a block to acceptance by CHEMTECH. The crucial point is whether the prior report is readily *accessible* to a polydisciplinary group who often are unaware that a particular piece of work could be valuable beyond its primary target.

We welcome reader recommendations of areas CHEMTECH should cover and/or authors to contact. *If you've come across work that has stimulated your thinking, please tell us about it.*

CHEMTECH's style

We have no fixed style criteria beyond a design to publish manuscripts that are easily read. Because we are now inundated with high-quality, timely manuscripts, we ask authors to be as terse as possible, consistent with our mission:

- To generate an awareness and interest but not necessarily expertise. Given the first two, and a good bibliography, expertise will follow.

As a style guide we recommend Strunk and White's "Elements of Style", Macmillan, New York, N.Y., 1959, 71 pp, paper $1.65. We also recommend use of a tape recorder for generating the first draft and a determined effort to eliminate jargon and verbiage that do not strengthen the argument. Deleting words such as *very, really,* and often *the* and *and* adds surprisingly to crispness. "In other words" often signals a redundant paragraph; inclusion of authors' names in the text, though polite, seldom helps the reader. Active, crisp, first-person case history reportage does. So do charts, graphs, flow sheet diagrams, and photographs (see below).

Reading through an issue of CHEMTECH before setting out to write often helps authors set tone and level of their manuscripts. Rendering complex concepts simple is difficult but, oh, so rewarding.

Literature references should be numbered and listed in order of reference in text. They should be listed by author, patentee, or equivalent. In the text, just the number should be used or the name should be followed by the number. "Anonymous" is not acceptable for authorship. If the author is unknown, list the reference by company, agency, or journal source. Do not list references as "in press" unless they have been formally accepted for publication. Give complete information, using abbreviations for titles of periodicals as in the Chemical Abstracts Service Source Index, 1975.

For periodical references to be considered complete, they must contain authors' surnames with initials, journal source, volume number, issue number (if any), the first and last page numbers of the article, and the year of issue. State if a reference is in a language other than English.

Graphics

In general, graphs are preferable to tables if precise data are not required. When tables are submitted, however, they should be numbered consecutively in Arabic numeral style in order of reference in the text. Double space with wide margins, and prepare tables in a consistent form, each on a separate $8\frac{1}{2} \times 11$ sized sheet.

Original drawings or sharp glossy prints of graphs, charts, and diagrams are acceptable. All lines, lettering, and numbering should be sharp and unbroken. If coordinate paper is used, use blue cross-hatch line as no other color will "screen out".

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Photographs should be supplied in glossy print form, as large as possible, but preferably within the frame of 8×10 in. Sharp contrasts are essential.

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